



RESIDENTIAL

INDOOR

AIR QUALITY

AWARENESS

2016 Edition

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Heating, Refrigeration and Air Conditioning
Institute of Canada

FOREWORD

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Preface

The issue of indoor air quality (IAQ) has recently taken centre stage due to the efforts of building and health scientists who are encouraging industry to address the indoor environment quality in both low and high performance buildings.

The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI), with industry guidance, developed the following materials to complement the HVAC skills its members need to serve homeowners, renovators and builders.

Upon successful completion of the Heating Refrigeration and Air Conditioning Institute of Canada's Residential Indoor Air Quality Awareness (IAQ) course, participants will be able to knowledgeably discuss with clients and colleagues, the architectural, mechanical and human elements related to acceptable IAQ for existing and new homes based on current industry requirements and good practices.

Participants should be aware that indoor air quality industry requirements and good practices are constantly evolving and the curriculum for this course includes information available when the course material was prepared.

This course does not provide participants with the skills needed to perform forensic, scientific, or health studies, or to diagnose or make recommendations regarding IAQ problems where these problems have generated occupant illness or life safety issues; these require the engagement of professional building and health scientists.

Overview

This manual is comprised of 7 chapters which address general elements of Indoor air quality (IAQ) theory and application. In addition, ASTM standard D 7297 “Practice for Evaluating Residential Indoor Air Quality” guidelines are included in the course manual. In addition to ASTM and ASHRAE standards, refer to local codes as well as CSA F326 standard for ventilation requirements and delivery methods. The intent to develop this course was to serve HVAC industry as a training manual as well as provide them with a reference book for achieving optimal Indoor Air quality in new and existing constructions. The course will also delve into each of the elements in HVAC systems responsible for conditioning the occupants and space, including a review of ventilation strategies and filtration methods. The course is structured in an interactive format requiring participation from participants, with workshops and assignments included in the two-day program. The course also familiarizes participants with the IAQ investigate procedures to develop skills needed to design in accordance with IAQ industry standards. Below is a brief summary of what you will learn in each chapter of this course manual.

Chapter 1 introduces indoor air quality in general terms with a short study on humans physiology, followed by a review of codes/standards/guidelines, contaminants and pollutants, elements of house construction.

Chapter 2 provides group work assignments to explore and challenge student’s knowledge and intuitions of how human/machines and materials applied in the construction process have the potential to create poor IAQ. This chapter explores the concept of factors affecting IAQ and how occupants should not be expected to compensate for bad design or building flaws versus being environmentally irresponsible.

Chapter 3 provides a summary of common IAQ prevention techniques and also introduces the field of climatology, hydrology, and geology and how these sciences relate to building construction and IAQ. Participants will discuss pre and post occupancy preventative solutions.

Chapter 4 provides a synopsis of common IAQ measuring instruments and measurements techniques of air quality metrics. A review of field and laboratory devices and authoritative documents from industry specialists is included. This will assist participants who later opt to expand their skills through specific hands on instrument user courses.

Chapter 5 is an introduction and review of ASTM standard D 7297-14 Practice for Evaluating Residential Indoor Air Quality concerns. This consensus document provides a method to consistently address indoor air quality complaints in residential buildings and to guide IAQ investigations in an efficient manner. It is important to note that this session and course is not to qualify participants in investigative procedures; rather it is intended to make participants aware of the investigative procedures according to the ASTM standard. It also serves to instruct participants who wish to develop investigative skills they need to participate in professional training related to national and provincial building codes and the Freedom of information acts and any personal health and information acts.

Chapter 6 details modern construction practices and materials being used to prevent or solve air quality problems. Operation and maintenance of the building systems will be reviewed including a look at the combustion appliances and large exhaust devices. How moisture and airflow can be managed in the house is also answered in this section. Techniques to prevent buildings from radon and proper combustion venting guidelines also make this section interesting for readers.

Chapter 7 compares indoor thermal comfort quality as governed by Canadian building codes and standards. Each of the elements in HVAC systems responsible for conditioning the occupants and the space will be discussed including a review of ventilation strategies and filtration methods.

NOTE: Canadian code requirements (NBC, OBC, BCBC) and the CSA F326 requirements will be briefly discussed throughout the course to ensure participants are familiar with these ventilation requirements.

Chapter One

Introduction to Indoor Air Quality

Objectives

Upon completion of this chapter, course participants will understand:

1. Why IAQ is important
2. How different organs and systems in the body are affected by IAQ
3. How the built environment becomes contaminated and with what types of pollutants
4. And describe building processes which promote good IAQ in general terms

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1.1 Introduction to Indoor Air Quality

In recent years, indoor air quality has become a concern in all types of buildings. Homeowners and potential homeowners are expressing concern about the quality of the indoor air in houses. IAQ in residential buildings has been the subject of research and product development efforts over the past 25 years. IAQ problems range from high humidity levels to spillage of combustion gases.

A house is said to have poor IAQ when the inside air contains enough of a substance to adversely affect the comfort, health or safety of the occupants. Such substances commonly found in the air in a house include:

- Odours,
- Chemical pollutants (formaldehyde, CO, CO₂),
- Radon Gas,
- Biological pollutants, moulds (from people, pets and plants),
- Particles (dust, pollen, smoke, mould spores).

